# Cooperation between school and companies so as to frame students' workplace activities

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# Cooperation between school and companies so as to frame students' workplace activities – the case of a cooperative program in an industrial engineer school in France,

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Abstract : Cooperative education is a pedagogical approach combining classroom-based education with practical work experience. This pedagogical trend is now widespread at a university level in France. Our presentation will focus on a three-years engineer course which is organised in a cooperative mode (alternation of periods of 1 month at school and 1 month in a company). The overall aim of the course is to train engineers able to manage complex production systems and to improve them, in their various aspects (organisational, technical and economical). Within the workplace, the students' tasks and working conditions are not only defined by the company tutor, but must also be consistent with school recommendations. In this presentation we analyse how this engineering school collaborates with its industrial partners (companies which are engaged in this teaching ; program) on a pedagogical point of view. Our theoretical framework is based on the work of anthropologists like M. Douglas (1999) and J. Lave (1991) and French didacticians as Y. Chevallard (1992). Our methodology is based on two case studies. We have followed and observed two students' complete trajectories (3 years each) in two different industrial workplaces (pharmaceutical products; paper industry). Our case studies show that school recommendations often go against the social, technical and economic organisation of the companies. According to the specificities of the companies, students engaged in the cooperative program have developed quite different skills and knowledge in the workplace. These results point out that cooperation between schools and companies with the view to creating and managing training programs is complex. It ideally needs a strong mutual understanding, which proves difficult considering the specific constraints of each type of institution.
Keywords : workplace learning ; cooperative education ; tutoring ; vocational didactics

Cooperative education is a pedagogical approach combining classroom-based education with practical work experience. This pedagogical trend is now widespread at a university level in France. Since the beginning of the nineties, many Bachelor and Master programs, as well as engineer schools have decided to set up their courses with a view to facilitating students' school- to- work transitions and newcomers' efficiency in workplaces.

Our presentation focus on a three-years engineer course which is organised in a cooperative mode (alternation of periods of 1 month at school and 1 month in a company). The overall aim of the course is to train engineers, both able to manage complex production systems and to improve them, in their various aspects: organisational, technical and economical. Each student is supervised by 2 tutors: a supervisor from the school; and an engineer from the company. Within the workplace, the student' tasks and his working conditions are not only defined by the company tutor, but must also be consistent with school recommendations. More precisely, trainers are convinced that each student must follow a specific trajectory in the company to become a particular type of engineer.

In this presentation we will try to answer two types of questions about the cooperative program:
- How can schools and their industrial partners (companies which are engaged in this teaching program) collaborate? Is it possible for companies to satisfy the school recommendations while complying with its social and technical constraints and specificities?
- What do student's activities really consist in? What types of knowledge and skills do they acquire in companies? Are these knowledge and skills consistent with the school's official pedagogical objectives?

## Theoretical framework

To answer these research questions, we have developed a theoretical framework mainly based on the work of the English anthropologist Mary Douglas (1988) and Yves Chevallard (1992), a French researcher in mathematics education. We consider that during their activity in a company, the students interact with successive material, symbolic and human *objects*, with which they can develop different types of cognitive and practical *relations*. For example, a student who starts using a manufacturing machine to produce mechanical parts, creates progressively a kind of relationship with this machine which can be called "using relation". Thus, he develops some kind of knowledge about this machine, which is different from the one created by an industrial millwright installing or repairing this machine. Relations to the objects are never created outside institutions. An institution is a legitimate social group (Douglas, 1988), as for example a family, a classroom or a department within a company. All institutions generate their own world of objects. People in the institution must integrate to some extent its "milieu" (defined as all the objects that the institution has recognised) and the thought-world associated in order to become a member. Thus, the individuals' actions and relations towards objects

are largely shaped by the institution. In particular, there are different social positions within an institution (in our case, for example: apprentice, worker, millwright or engineer in a production department), which determine the objects that someone has to consider and the type of relation he has to develop with them.

To help people (or to try to force them) to create relations with the right objects, in compliance with the institutional rules, formal or non formal training systems can be set up within institutions. A training system exists as soon as:
- There is a didactical stake, i.e. the student has to create some relations to new objects or to change his relation to some objects that he already knows but from a different point of view.
- Someone takes the position of a teacher;
- Someone else takes the position of a student;
For example, a training system temporarily takes place when a company tutor decides to explain to his apprentice how to manage a meeting with workers in the factory. Obviously, the learning outcome resulting from these teaching systems is not already in compliance with the thought-world of the institution. Some "wrong" relations can exist and develop within the institution for many reasons. One is particularly interesting for us: when people have difficulties in modifying their relations to some objects, because they have built another type of relation to similar objects in other institutions to which they have belonged previously or simultaneously. In this case, this previous relation is an epistemological obstacle in creating another type of relation.

To summarise our questions in a theoretical way:

1) Our assumption is that school, as some other cooperative education systems, tries to generate more organised training systems within workplaces. But how can this institution affect another one – a company for instance – in order to enhance on-the-job learning possibilities, in compliance with its official pedagogical aims?

2) The next point is then: what types of objects do students meet and what types of relations do they create with them? Do they become the type of engineers expected by school?

**Methodology**

Our methodology is based on two case studies. We have followed and observed two students during all the time of their vocational training in the company (3 years each) in two different industrial workplaces (pharmaceutical products / paper production) to compare the effects of non similar contexts. We have used two complementary scales of analysis:
- A global scale : several long interviews with the 2 students and their 2 tutors to recapitulate the formers' activity during the 3 years of training ;
- A local scale : 8 observation days in the company (hand notes to describe the student's activity; records of his verbal exchanges with other people; copies of his documents) to understand more deeply the context and the contents of the student's activities.

We have built some special tabs with different columns (1-time, 2-place, 3-activity of the student, 4-people, actions, events and artefacts around him), to synthesise the students' activities in their social, material and symbolic contexts. Then, we have divided this description into different parts, according to the institution to which the student belongs and his position within this institution. Finally, we have tried to locate the training systems created and analyse their real effects on learning.

**Main outcomes**

The analysis of the school guidelines highlights that companies must collaborate with the school in order to set up 3 macro training systems:
- The first training system is to learn what is a concrete factory and how working teams and production lines are organised day by day. The student has a worker's position and learns the job under the authority of more experienced workers (1 month).
- The purpose of the second training system is to learn how to make an industrial diagnosis and find improvements to increase the productivity, the security or the quality, etc. The position of the student must change, but the school does not precisely indicate where the company tutor has to put him in the flow-chart. (6 months).
- The third training system is more explicit: the student must hold the position of a real project manager and has to consider different aspects: technical, economic, social,
etc. (2 years).

From the analysis of these two case studies, we can make the following observations:

1) These two companies do not equally respect the rules of the game set by the school. Thus, the tutor from the first company has done his best to implement the three training systems since he is fully convinced by the pedagogical organization promoted by the school, all the more so as he has experienced some lacks in his own training. In the second case, the first company tutor (he has been replaced by another supervisor during the training) is far more reluctant to play game as he has got many projects in progress and needs the apprentice immediately as a method technician. The training phase in the workshop and the designing process of a project sounds like a waste of time to him.

2) These training systems and more generally the school recommendations often go against the social, technical and economic organisation, constraints and possibilities of the companies. According to the specificities of their company, the 2 students have developed different skills and knowledge in the workplace.
- The first student has become progressively more and more expert in the narrow technical domain of the cleanness of paper but has great difficulties in learning how to manage production teams. For example, some relations created within the factory (institution 1 / stage 1) with the workers or the industrial artefacts prevent the creation of new relations to these objects during the third stage in another institution (engineering department).
- The second student has built strong industrial project management skills which are closer to the school aims. This is a paradox in so far as the first company tutor of this student doesn't really want to collaborate with the school. But in this case, there are not real epistemological obstacles in the learning process as the student starts and stays in the same institution all along the training course. Moreover, some informal training systems took place easily to transmit knowledge and experience to this student.

These results point out that the cooperation between schools and companies in creating and developing training programs is complex. It ideally needs a strong mutual understanding, which is difficult considering the specific constraints of each type of institution.

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